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PATENTED FEB. 19, 1907.

W. J. ENNISSON.
TYPE JUSTIFYING MACHINE.

APPLICATION FILED JUNE 14, 1899.

3 SHEETS—SHEET 1.

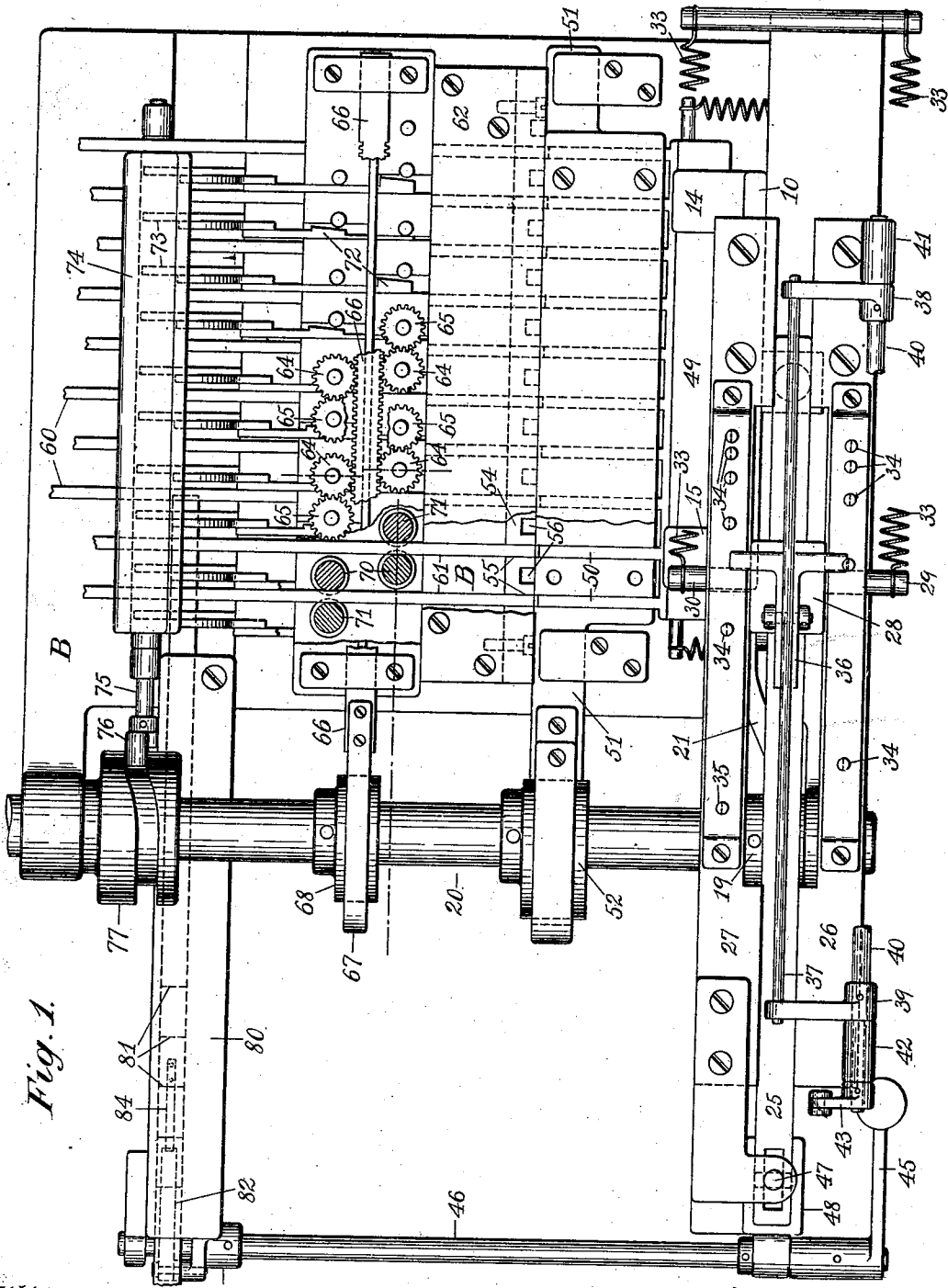


Fig. 1.

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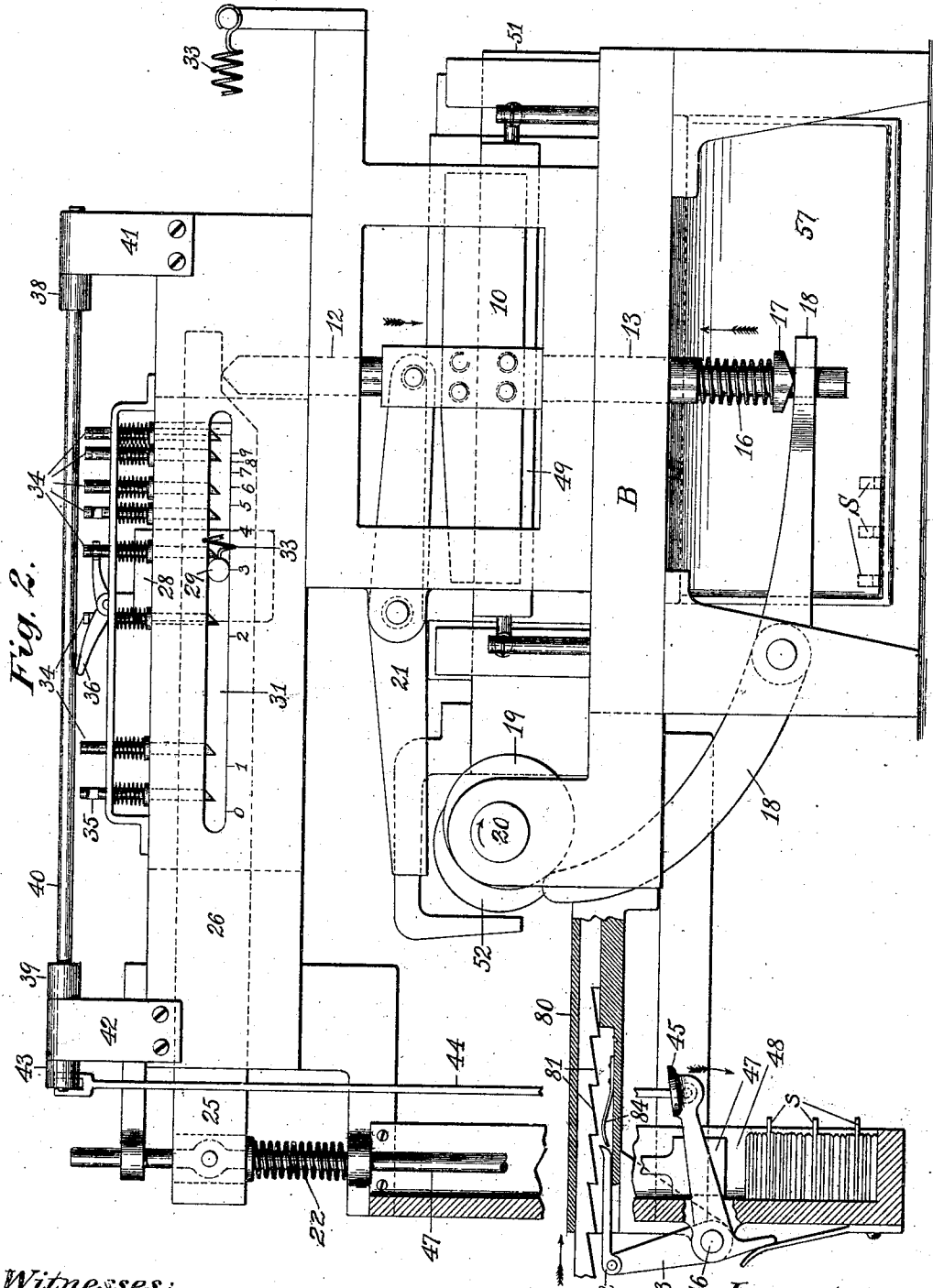


Fig. 2.

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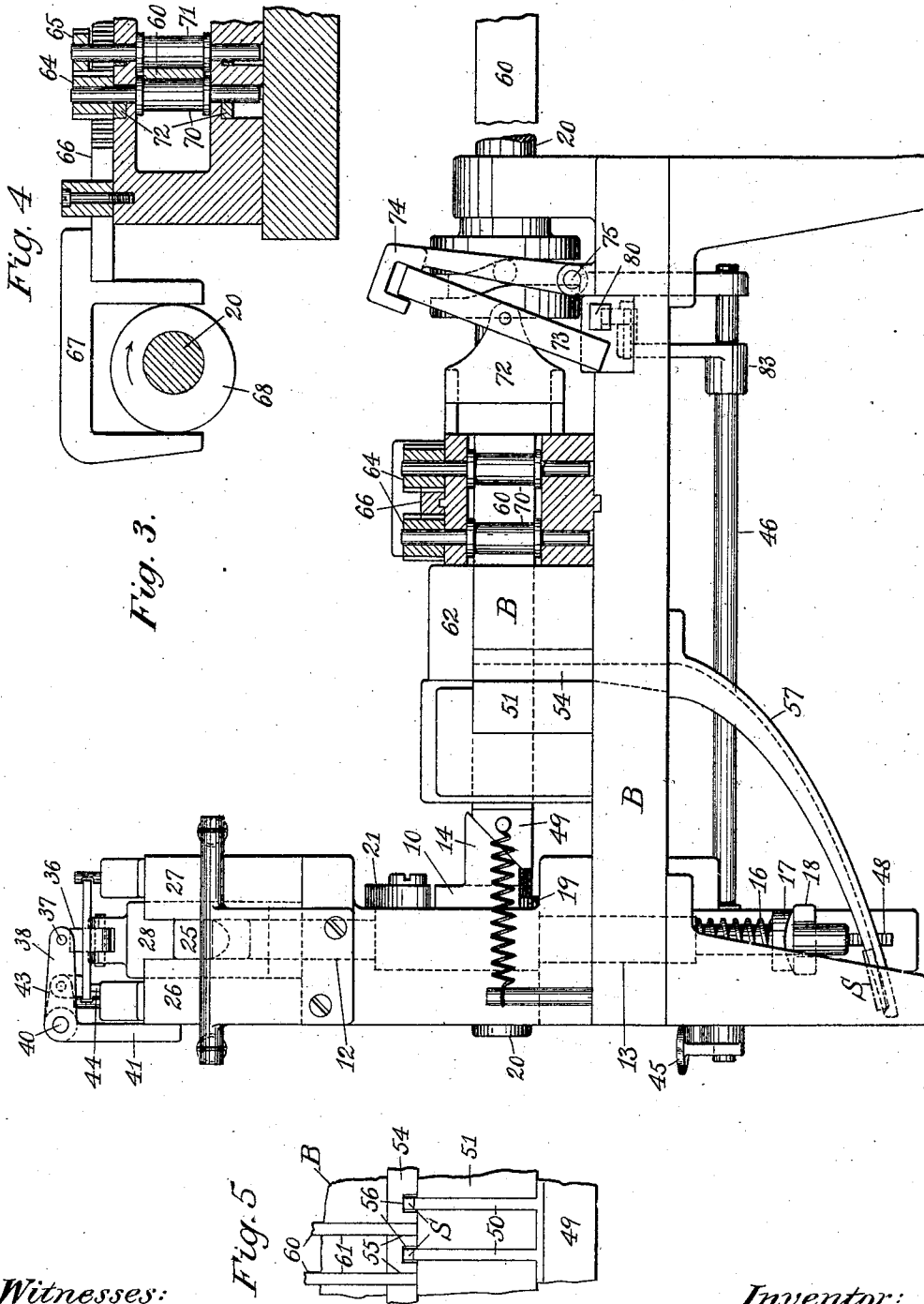
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

WALTER JAY ENNISSON, OF HARTFORD, CONNECTICUT, ASSIGNOR TO
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TYPE-JUSTIFYING MACHINE.

No. 844,568.

Specification of Letters Patent.

Patented Feb. 19, 1907.

Application filed June 14, 1899. Serial No. 720,450.

To all whom it may concern:

Be it known that I, WALTER JAY ENNISSON, a citizen of the United States of America, and a resident of Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Type-Justifying Machines, of which the following is a specification.

This invention consists of certain improvements in justifying mechanism which are shown herein as embodied in an apparatus comprising means for measuring a line of type to ascertain its shortage, for dividing the shortage in accordance with the number of word-spaces in the line, for setting a gage in accordance with the required thickness of the justifying-spaces, for forming justifying-spaces by cutting off spaces of the required thickness from strips of "space-timber," and for feeding as many pieces of space-timber to the cutting devices as may be required for each line to be justified.

The invention includes certain broad features of construction and combinations of parts in justifying mechanism, some of which relate particularly to apparatus for forming justifying-spaces by cutting off space-timber, while others may be embodied in justifying mechanism of other classes, and the invention also comprises certain details of arrangement and construction tending to facilitate and improve the difficult operation of justifying composed lines of type.

Figure 1 of the drawings is a plan view of the machine. Fig. 2 is a front view, partly in section; and Fig. 3 is an end view looking from the right-hand side of Figs. 1 and 2. Fig. 4 is a front fragmentary view in section taken on the line 4 4 of Fig. 2, showing the feeding-rolls engaging a piece of the space-timber and showing the devices for causing the rolls to grip and feed the space-timber. Fig. 5 is a fragmentary plan view with the cap for the cutting-off slide removed and showing the operation of ejecting a cut-off space from the cutter-bar into the channel or runway through which it passes into the reach of the operator.

The operative parts of the machine comprise the following devices, grouped in a general way in accordance with the respective functions performed by them, namely: a gage for determining the width of justify-

ing-spaces, a justifying-lever having one end operating on the gage, a device for measuring the line and operating upon the other end of the lever, a series of fulcrums for the justifying-lever located at one-half, one-third, one-fourth, one-fifth, &c., of the length of the lever from its point of connection with the gage, means for rendering any one of the said fulcrums operative according to the number of word-spaces in the line, devices for feeding strips of space-timber against the gage, a cutter-bar and a cooperating cutter-slide for cutting off justifying-spaces from the timber in the widths determined by the gage, means for ejecting the cut-off spaces from the cutter-slide into channels or runways, whence they pass within the reach of the operator, and means for selecting and feeding forward the right number of strips of space-timber in accordance with the number of word-spaces in the line.

The various parts comprising this apparatus are mounted upon the bed or frame B, in which is rotatably mounted the cam-shaft 20. This shaft and bed may be extended from or connected with the type-composing machine with which this apparatus is combined, the shaft being driven intermittently at a suitable time by means of any of the well-known single-revolution clutch devices, which may be released by a key located in the keyboard of the composing-machine, or, if the apparatus is used independently, the shaft may be provided with a similar clutch operated by a special key, or the shaft may be provided with a crank and be manually operated at the proper time.

The gage for determining the widths of the justifying-spaces is herein shown as being in two separate parts in order to enable the justifying-lever, which controls the movement of the gage, to operate in a plane at right angles to that in which the space-timber strips are fed. Therefore one of these gages is mounted to move in a vertical plane in accordance with the movement of its associated end of the justifying-lever, while the other portion of the gage moves in the horizontal plane of the space-timber. The two portions of the gage abut against each other by means of surfaces which are preferably inclined at forty-five degrees to their respective planes of movement, so that the ver-

tical movement of one gage is transmitted or converted into an equal horizontal movement of the other gage. For the sake of clearness the horizontal portion of this gage will be hereinafter designated as the "gage-plunger," since it also operates as a plunger to eject the severed spaces from the cutting-slide, while the vertically-moving portion of the gage will hereinafter be designated simply as the "gage."

The gage 10 is fitted to slide vertically in the bed B by means of cylindrical bearings 12 and 13 and bears against its plunger by means of the inclined lugs 14 and 15. The upper end of the gage abuts against the right-hand end of the justifying-lever 25, while its lower end is provided with a compression-spring 16, located between a shoulder of the gage and a thrust-collar 17, which is splined upon the bearing, so as to slide freely thereon without turning round. The lower side of this collar engages, preferably by a knife-edge bearing, as shown in Fig. 2, with one end of a cam-lever 18, pivotally mounted upon the bed B, the other end of which engages with the cam 19, fixed upon the cam-shaft 20. The upper portion of the gage 10 is pivotally connected with the ejecting-lever 21, pivotally mounted on the bed B and having its opposite end extending over the cam 19 and in engaging relation thereto. The cam is so shaped and the engaging ends of the levers 18 and 21 are so disposed as to impart the desired movements of the gage in both directions, the gage being moved by the cam through the medium of the lower lever 18 to operate the justifying-lever in the measuring operation, while the gage is moved downwardly at the required time, so as to eject the cut-off spaces from the cutting-slide.

The justifying-lever 25 consists of an elongated bar which is connected at one end with the line-measuring devices and at its other end with the gage, as above described. The intermediate portion of the bar is adapted to be supported upon any one of a series of fulcrums located at one-half, one-third, one-fourth, &c., of the operative length of the lever from the point which is connected to the gage, the locations of these fulcrums being indicated in Fig. 2 by numerals corresponding with the number of word-spaces in the lines for which these fulcrums are respectively suited. These fulcrums are established along the plane surfaces of two horizontal guide-bars 26 and 27, so as to facilitate the transfer of the interponent 28 from one fulcrum to the other. That interponent herein consists of a block provided with a mortise which fits upon and slides freely along the justifying-lever. This interponent is also provided with the laterally-extending trunnion-bearings 29 and 30, which extend across and rest upon the ful-

crum-surfaces of the bars 26 and 27, respectively, and which are fixed to or integral with the interponent block 28. The trunnions are prevented from rising from the fulcrum-surface during their operations by an overlying portion of the bar, which may be a removable cap, or the bar may, as herein shown, be formed with the slots 30 and 31, the sides of which form the fulcrum and retaining surfaces, respectively, for the trunnions, which turn freely upon those surfaces during the line-measuring operation.

The interponent 28 is drawn toward the right, as shown in Figs. 1 and 2, by means of the springs 33, attached to the bed B, and the interponent is stopped at the successive fulcrums by means of the stop-pins 34, located in the upper portions of the bars 26 and 27. The pins for the successive fulcrum positions are alternated in the two bars, as shown in the plan view of Fig. 1, in order to enable them to be of suitable size and convenient arrangement.

In the drawings the apparatus is shown to be set in position for operating upon a line having three word-spaces. Therefore the interponent rests upon the fulcrum, which is located at one-fourth of the effective length of the beam from its point of connection with the gage. The stop-pins are provided with springs which tend to press downwardly into the path of movement of the trunnions 29 and 30, and each pin is adapted to be raised so as to permit the interponent to be drawn to the next fulcrum by means of the lever 36, which is pivoted upon the interponent 28. The T-shaped end of the lever extends across so as to engage with any one of the pins in the two rows, as best shown in Fig. 3, the upper ends of the pins being slotted on their inner faces to permit the passage of the T-shaped ends of the lever and to afford shoulders for raising them. The other end of the lever lies beneath the operating-rod 37, which is mounted in the arms 38 and 39 and extends far enough to overlie the lever 36 in all positions of its travel. These arms are pinned upon the shaft 40, journaled upon the brackets 41 and 42, and the left-hand end of the shaft is provided with an arm 43, which is connected, by means of the rod 44, with the space-key 45, by means of which the interponent is released and permitted to move to its successive fulcrums as the word-spaces are added to the line.

The lower ends of the stop-pins 34 are beveled, so that the interponent may be returned to its zero position, which is behind the pin 35, at the conclusion of each line, the first stroke of the key for the first word-space of the line serving to permit the interponent to move against the first of the stop-pins 34.

The left-hand end of the justifying-lever is pivotally connected to the measuring-slide

47, which is fitted to slide vertically in the bed B, and that end of the bar and the slide is provided with a light spring 22, suitable for supporting the weight at that end, or the other end of the justifying-lever may be suitably counterbalanced for the same purpose. The lower end of the slide 47 extends into a type-channel 48 into engagement with the line of type, as shown in Fig. 2, the type being transferred to this channel in any convenient way from the composing machine or stick for the measuring and justifying operations.

The gage-plunger 49 consists of a bar having one side beveled to fit against the inclined lugs 14 and 15 of the gage and is provided with a series of fingers 50, which extend from the opposite side of the bar and are fitted to slide transversely in mortises or dies in the cutter-slide 51, the space-timber being fed into these mortises against the ends of the gage-plunger fingers to the extent permitted by the setting of the gage from the justifying-lever. The cutter-slide is moved longitudinally of the bed in suitable ways by means of the cam 52 on the cam-shaft 20 to an extent shown by comparison of Figs. 1 and 5.

The cutter-bar 54 is fixed to the bed of the machine and is provided with a series of mortises or die-openings 55, which coincide with those of the cutter-slide when the latter is in the resting position. (Shown in Fig. 1.) The cutter-bar is also provided with a corresponding series of vertical space-channels 56 adjacent to the die-openings 55, into which the spaces are ejected by the plunger-fingers, as shown in Fig. 5, after being cut off from the space-timber.

The space-timber strips 60 are fed into the machine through the channels 61 of the bed beneath the cap or weight 62, which rests upon the inner ends of the strips and by frictional contact prevents their inadvertent withdrawal or displacement. These strips are fed forward by means of a series of drawing-rolls 70 and 71, arranged in pairs in two rows, as best shown in Fig. 1. Each pair of rolls is provided with connecting-pinions 64 and 65. The latter pinion is comparatively narrow, while the other pinion 64 extends downwardly into engagement with the teeth of the rack 66, which is fitted to slide longitudinally of the bed and engages with a corresponding pinion 64 of each of the pair of rolls, the connections being so made as to rotate each pair of rolls in a direction suitable for feeding their respective strips forward when the rack is moved in one direction, the rolls returning to their first position upon the return movement of the rack. That rack is provided with a cross-head 67, which engages with a cam 68 on the shaft 20, as best shown in Fig. 4, the timing of the cam and its extent of movement being adapted to impart the

proper feeding movement to the strips in harmony with the movements of the other portions of the machine.

One of the rolls 70 has its bearings elongated, so that it may be moved slightly to and from its mate, thereby alternately gripping and releasing the strip of space-timber, the gripping taking place during the feeding movement and the releasing during the return movement of the rolls. As a means for thus causing the rolls 70 to grip their respective strips of space-timber a series of bifurcated wedges 72 are employed, which extend transversely past the bearings of the gripping-rolls 70, as best shown in Figs. 1, 3, and 4. Each of the wedges 72 is provided with a lever 73, as best shown in Fig. 3, and the upper ends of the entire series of levers are engaged by means of the arm 74, fixed upon the shaft 75. That shaft is pivotally mounted upon the bed and is provided with the cam-arm 76, which engages with the cam 77, fixed upon the shaft 20, and the cam is so formed as to cause the arm 74 and its connected series of wedge-pieces 72 to grip and release the feeding-rolls simultaneously and in suitable timing with relation to the feeding operation of the cam 68.

It is desirable in machines of this class to cut off only the number of strips required to justify each line, and to this end means are provided herein for feeding forward only the number of space-timber strips corresponding to the number of word-spaces in the respective lines. The lower ends of the wedge-levers 73 are engaged by an abutment 80, which is capable of longitudinal movement along the bed behind the lower ends of those levers, it being obvious that the wedge-lever arm 74 will only operate such of the levers 73 as are engaged by the abutment 80, the other levers swinging idly upon their pivotal connection with the wedge-pieces 72, and thereby not operating those wedges. The abutment 80 stands at the beginning of the composing of the succeeding line entirely clear of all of the levers 73 and is advanced during the composition of the line one step for each added word-space, so that at the conclusion of the composing operation and the commencement of the measuring operation the abutment has been thus projected behind as many of the levers 73 as are represented by the number of word-spaces in the line, so as to grip, and thereby enable to be fed forward, a corresponding number of strips of space-timber. As a means for thus feeding forward the abutment it is provided upon its lower side with ratchet-teeth 81, as best shown in Fig. 2, the spacing of the teeth corresponding with the lateral separation of the levers 73. These teeth are acted upon by the pawl 82, pivotally mounted upon the arm 83, fixed upon the space-key shaft 46. As that key is depressed for each of the

word-spaces the pawl 83 is carried forward from the position shown in Fig. 2 and its toothed end is moved by the spring 84 into engagement with the adjacent ratchet-teeth of the abutment 80, the amplitude of movement being sufficient to carry the leading end of the abutment forward one space behind the lower end of an additional wedge-lever 73. Thus at the commencement of the measuring operation upon any given line the space-key has been operated to set the interponent 28 in suitable position for that line and has also set the space-timber-feeding devices so as to cause them to feed forward the appropriate number of strips.

The operation of this apparatus is substantially as follows: As each line is composed the operator depresses the space-key 45 for each of the word-spaces contained in the line, thus setting the interponent 28 and the abutment 80 in the manner already described to positions appropriate for that line. A single rotation is then imparted to the cam-shaft 20 either manually or by means of a suitable single-revolution clutch or other device. During the first portion of the rotation the cam 77 operates to clamp the feeding-rolls upon as many of the space-timber strips as are required for the justification of the line, and the cam 68 then operates to feed forward those strips to the distance determined by the gage. During this time the cam 19 operates through the lever 18 to move the gage 10 upward until the measuring-slide 47 stops against the line of type, thus determining the position of the gage, the gage-plunger 49 being drawn by its springs against the inclined surfaces of the lugs 14 and 15 of the gage. The gage and the space-timber are locked to place in this position by the line of type at one end and by the feeding-rolls at the opposite end. While in this position the cutter-slide 51 is moved by its cam 52 from the position shown in Fig. 1 to that shown in Fig. 5, thereby severing those portions of the space-timber which project beyond the cutter-bar 54, thus forming the justifying-spacers S, which are carried by the movement of the cutter-bar to the position shown in Fig. 5 opposite the spacer-channels 56, into which they are then ejected by the plunger-fingers 50 by means of the cam 19 operating upon the gage 10 through the medium of the lever 21. The severed spacers fall through their respective channels upon the inclined apron 57, along which they slide to a position convenient to the hand of the operator, who inserts them in the line in place of the temporary separators s. At the conclusion of the operation upon each line the interponent 28 is returned by the hand of the operator to the zero position behind the index-pin 35, the beveled lower ends of the pins allowing them to ride over the trunnions 29 and 30. The abutment 80 is also returned to its original

position clear of the wedge-levers 73, thus restoring the parts to their original position ready for operation upon the succeeding line.

While the mechanism shown as embodying the invention is adapted for handling ordinary type, and the invention is especially intended for such use, it will be understood that the invention is not limited to machines for justifying such ordinary type, but may be applied also in justifying type, matrices, or the like of any suitable material, and that the word "type" is used in this specification and the claims in this broad sense. Certain features of the invention also are applicable not only in machines for justifying composed lines of type or matrices, but in line-justifying mechanism of other classes and in machines in which the justifying-spaces are formed otherwise than by cutting from space-timber.

I claim as my invention—

1. The combination of automatic devices for measuring a previously-composed line of type, a gage controlled by the measuring devices and the number of spaces in the line, and means for cutting off the required number of justifying-spaces simultaneously in accordance with the position of the gage.
2. The combination of automatic devices for measuring a previously-composed line of type, a gage controlled by the measuring devices and the number of spaces in the line, means for feeding a plurality of strips of space-timber an amount determined by the gage, and means for cutting off justifying-spaces.
3. In a line-justifying apparatus in combination with devices for feeding and cutting off justifying-spaces, means for feeding forward a plurality of strips of space-timber in accordance with the number required by the line to be justified.
4. In a line-justifying apparatus, in combination with devices for feeding space-timber strips and cutting off justifying-spaces therefrom, means operable by a space-key for determining the number of space-timber strips to be fed forward.
5. In a line-justifying apparatus, in combination with devices for cutting off justifying-spaces, a pair of feeding-rolls for engaging with the space-timber, means for gripping the rolls upon the timber and controlling the gripping and release of the rolls according to the number of spaces in the line, and means for rotating the rolls when gripped.
6. In a line-justifying apparatus, in combination with devices for cutting off justifying-spaces from space-timber, means for feeding a series of separated space-strips simultaneously forward to the cutting devices.
7. The combination of a cutter bar and slide provided with a coincident channel for the passage of a strip of space-timber, a space-channel located in the cutter-bar adjacent to

the timber-channel and means for moving one of the parts so as to cut off a justifying-spacer from the timber and carry it to the space-channel.

8. The combination of a cutter bar and slide provided with a coincident channel for the passage of a strip of space-timber, a space-channel located in the cutter-bar adjacent to the timber-channel, and means for moving one of the parts so as to cut off a spacer from the timber and carry it to the space-channel.

9. The combination of a cutter-bar provided with a series of channels for space-timber, a cutter-slide provided with channels coinciding with those of the cutter-bar, a series of space-channels located in the cutter-bar adjacent to the timber-channels and means for moving the cutter-slide, whereby spacers are cut from the ends of the space-timber and carried into register with the space-channels.

10. The combination of a cutter-bar provided with space-timber channels, a cutter-slide provided with corresponding channels, and with a gage-plunger fitted therein, a series of space-channels located in the cutter-bar adjacent to the timber-channels thereof, means for moving the cutter-slide so as to cut justifying-spacers from the ends of the space-timber and carry them opposite the spacer-channels and means for operating the gage-plunger to eject the spacers into their respective channels.

11. In a justifying mechanism, a justifying device comprising a lever, a series of fixed fulcrums for said lever, and means for rendering any one of said fulcrums operative upon the lever without moving the fulcrum, the fulcrum rendered operative depending upon the number of spaces in the line.

12. In a justifying device, a gage for determining the width of justifying-spaces, a device for measuring the line of matter, a justifying-lever having its ends operatively connected with said gage and said device respectively, a series of fixed fulcrums for said lever, and means for rendering any one of said fulcrums operative upon the lever without moving the fulcrum, the fulcrum rendered operative depending upon the number of spaces in the line.

13. In a justifying mechanism a movable device for measuring unjustified lines, a movable gage, intermediate mechanism by means of which the gage is set from the measuring device, and means for forming the number of justifying-spaces required for the line simultaneously, the width of said justifying-spaces being determined by the gage, substantially as described.

14. In a justifying mechanism a movable device for measuring unjustified lines, a movable gage, intermediate mechanism by means of which the gage is set from the measuring device means for feeding a plurality of space-

timber strips, and a cutter adapted to sever justifying-spaces from said space-timber, the width of said justifying-spaces being determined by the gage, substantially as described.

15. In a justifying device, the combination of a cutting-block, a cutter, a gage, means for automatically setting the gage relatively to the cutter for each line to be justified means for feeding a plurality of strips of space-timber, and means for locking the gage while the justifying-spaces for the line are being cut, substantially as described.

16. In a justifying mechanism, the combination with means for feeding a plurality of strips of space-timber, means for holding said strips, a cutter adapted to sever spaces from the strips, and means for releasing the strips and moving them forward to the cutter at proper intervals.

17. In a justifying mechanism, the combination with a justifying-lever and a series of fulcrums, of a space-key, an interponent between the lever and fulcrums, and means for setting the interponent from the space-key to pivot the lever upon one of the fulcrums according to the number of spaces in the line.

18. A justifying mechanism including devices for measuring an unjustified line, and means controlled by said measuring devices for forming simultaneously the number of justifying-spaces required for the line.

19. A justifying mechanism including devices for measuring an unjustified line, devices for dividing the shortage in the line by the number of word-spaces, and means controlled by said devices for forming simultaneously the number of justifying-spaces required for the line.

20. In a justifying mechanism, a justifying-lever having a pivoting member forming a part of said lever but movable thereon, and means for adjusting said member on the lever in accordance with the number of spaces in the line.

21. In a justifying mechanism, a justifying-lever having a pivoting member forming a part of said lever but movable thereon, a space-key, and connections between the space-key and movable member for adjusting the member in accordance with the number of spaces in the line.

22. The combination of automatic devices for measuring a composed line of type, by engagement therewith, a gage controlled by the measuring devices and means for forming simultaneously the justifying-spaces required for the line in accordance with the position of the gage.

23. The combination of automatic devices for measuring a composed line of type by engagement therewith, a gage controlled by the measuring devices for cutting off justifying-spaces in accordance with the position

of the gage, and means for feeding a plurality of strips of space-timber an amount determined by the gage.

24. In a justifying mechanism, a justifying-lever, a space-key, and a part coöperating with said lever and adjustable from the said key, its relation to the lever for each line depending upon the number of spaces in the line, in combination with means for holding and measuring a composed line of type and means for forming simultaneously the required number of justifying-spaces in accordance with the movement of the lever.

25. In mechanism for justifying composed

lines of type, a justifying-lever, a measuring device, a word-space key, and an adjustable space-determining device, all coöperating, in combination with means for holding a composed line of type for the measuring device and means for forming simultaneously the required number of justifying-spaces.

Signed by me at Hartford, Connecticut, this 13th day of June, 1899.

WALTER JAY ENNISSON.

Witnesses:

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W. H. HONISS.